# EPA

United States Environmental Protection Agency
Washington, DC 20460

## Work Assignment

Work Assignment Number: 1-13

☐ Other ☐ Amendment Number:

| Contract Number | Contract Period | Title of Work Assignment/SF Site Name |
|---|---|---|
| EP-D-14-032 | 09/16/2014 To 09/15/2019 Base Option Period Number 1 | Improve BenMAP-CE/Allerogens |

Contractor: INDUSTRIAL ECONOMICS, INCORPORATED

Specify Section and paragraph of Contract SOW: Section 14

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/16/2015 To 09/15/2016

Comments:

THE WORK ASSIGNMENT INCLUDES 250 HOURS FOR PREPARATION OF THE WORKPLAN/COST ESTIMATE AND TO BEGIN THE WORK ASSIGNMENT. THE CONTRACTOR SHALL PROPOSE THE HOURS NECESSARY TO COMPLETE ALL TASKS. NO PREVIOUSLY PERFORMED WORK SHALL BE DUPLICATED. SEE ATTACHED SOW

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*): ☐

| Line | DCN (Max 6) | Budget/FY (Max 4) | Appropriation Code (Max 6) | Budget Org/Code (Max 7) | Program Element (Max 9) | Object Class (Max 4) | Amount (Dollars) | (Cents) | Site/Project (Max 8) | Cost Org/Code |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |
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### Authorized Work Assignment Ceiling

| | Contract Period: | Cost/Fee: | LOE: |
|---|---|---|---|
| | 09/16/2014 To 09/15/2019 | | |
| This Action: | | | |
| Total: | | | |

### Work Plan / Cost Estimate Approvals

| | Cost/Fee | LOE: |
|---|---|---|
| Contractor WP Dated: | Cost/Fee | LOE: |
| Cumulative Approved: | Cost/Fee | LOE: |

| | |
|---|---|
| Work Assignment Manager Name: Neal Fann<br>(Signature) (Date) | Branch/Mail Code:<br>Phone Number: 919-541-0209<br>FAX Number: |
| Project Officer Name: Carolyn Blake<br>(Signature) (Date) | Branch/Mail Code:<br>Phone Number: 919-541-5256<br>FAX Number: |
| Other Agency Official Name:<br>(Signature) (Date) | Branch/Mail Code:<br>Phone Number:<br>FAX Number: |
| Contracting Official Name: Natalia Fisher-Jackson<br>(Signature) (Date) | Branch/Mail Code:<br>Phone Number: 919-541-3564<br>FAX Number: |

## I. TITLE: Improving the Ability of the BenMAP-CE Tool to Quantify the Impact of Climate Changes in Aeroallergens on Human Health

## II. WORK ASSIGNMENT MANAGER (WAM):

Neal Fann
EPA, OAQPS, OAR
C539-07
RTP, NC 27711
919-541-0209

## III. LEVEL OF EFFORT:

Hours :
Duration: 5 months (April 15th to September 15th 2016)

## IV. BACKGROUND:

In 2003 the U.S. EPA contracted with a developer to create version 1.0 of the environmental Benefits Mapping and Analysis Program (BenMAP). That tool systematized a number of the steps of a health impact and benefits analysis that had previously been performed using the Criteria Air Pollutant Modeling System (CAPMS). Subsequent versions of BenMAP incorporated a number of new features, including a database that could be modified by end-users, more spatially resolved baseline health data and a broader array of health impact functions. The U.S. EPA has used BenMAP to estimate the avoided human health impacts and economic benefits of a number of air quality policies, including the 2002 Non-Road Diesel rule, the 2004 Clean Air Interstate Rule, and the 2011 Mercury and Air Toxics rules, among many others. Over 50 researchers have published over 25 journal articles using BenMAP.

Beginning in 2011, the U.S. EPA began redeveloping the tool from the ground-up to meet two goals: (1) create an open-source software platform so that anyone could see the software code and improve the program; (2) improve the performance, accessibility, capabilities and usability of the software. In the Fall of 2013, after iterating through dozens of beta versions, the U.S. EPA released version 1.0 of the environmental Benefits Mapping and Analysis Program—Community Edition (BenMAP-CE). In the winter of 2015, the Agency released version 1.1 of the software, which addressed a number of bugs identified in version 1.0 and incorporated several new features designed to make it easier for non-U.S. analysts to apply the program.

While analysts have used the BenMAP-CE tool to quantify both air quality- and temperature-related effects from future changes in the climate, the program has

so far not been used to characterize the effects of other stressors. The soon to be published USGCRP Climate and Health Assessment (health2016.globalchange.gov) identifies an array of human health impacts attributable to climate change. This work assignment directs the contractor to modify BenMAP-CE to make it better able to quantify these effects. One endpoint of this work is for use in EPA's Climate Change Impacts and Risk Analysis (CIRA) project, an on-going effort to estimate the domestic benefits (physical impacts and economic damages) of global greenhouse gas (GHG) mitigation. EPA is building on the existing CIRA project and expanding the effort to develop analyses to inform the next National Climate Assessment of the U.S. Global Change Research Program.

## V. STATEMENT OF WORK (SOW):

The Contractor shall conduct the following tasks in accomplishing the objective of this Work Assignment.

### Task 1: Develop a work plan and project plan

The Contractor shall develop a new work plan and update the system design document as described below.

### Task 1.a: Develop work plan and administer project

Within 20 calendar days of the effective date of this WA, the Contractor shall submit a work plan to the Work Assignment Manager (WAM). The Contractor shall arrange and conduct an initial phone conference with the WAM within one week of WA approval. Subsequent to this initial teleconference, the Contractor shall lead regular phone conferences on at least a weekly basis to discuss work progress and any issues associated with the work tasks. The Contractor shall prepare an agenda for such weekly meetings, record meeting minutes, and distribute such meeting minutes to all participants.

### Task 1.b: Update the system design document

The Contractor, consulting with the WAM, shall develop a comprehensive and detailed project plan for each task in this WA, specifying clearly the technical and functional basis for the new version:

- The minimum design characteristics of the new software
- A workflow describing the expected inputs and outputs of each new program algorithm, including example use cases.
- Desired behavior of the graphical user interface, including sketches of windows, location of hover text, etc.
- Protocol for quality assurance of each new feature.

- Sequence in which the Contractor will address the tasks below.

The Contractor shall not modify the source code until the WAM approves this project plan. The Contractor shall develop the system design document for each new BenMAP-CE feature on a rolling basis and in consultation with the Work Assignment Manager.

**Deliverables:**

1.1. Work plan
1.2. System design document

**Task 2: Develop the ability to quantify aeroallergen impacts**

The Contractor shall incorporate the ability to quantify aeroallergen impacts in the BenMAP-CE tool in two stages: (1) develop a memo outlining both the independent effects of aeroallergens, as well as those effects that occur in concert with air pollutants including fine particles and ozone; and; (2) modify the BenMAP-CE program logic, as needed, to incorporate these effects.

**Task 2.a: Memorandum**

The Contractor shall write a memorandum describing the effects of aeroallergens on human health, detailing the effects that may be attributed directly to aeroallergens, as well as the role of aeroallergens in modifying the risks attributable to pollutants including fine particles and ozone. The memorandum shall further consider the role of other climate related parameters in affecting the potency of aeroallergens, including temperature and temperature. When writing the memorandum, the Contractor shall draw upon the information reported in the Air Quality chapter to the USGCRP Climate and Health Assessment, particularly the references cited. The memorandum shall describe a proposed methodological approach for quantifying aeroallergen effects in BenMAP-CE, including data sources, proposed outputs/metrics, and anticipated challenges/limitations. This information shall support the system design document in task 1 above.

**Task 2.b: Modify the BenMAP-CE code**

Based on review, discussion, and approval of the proposed approach described in Task 2.a by the WAM, the Contractor shall modify the BenMAP-CE program so that users can quantify aeroallergen effects, without accounting for the modification of these effects by air pollutants. The Contractor shall modify BenMAP-CE so that:

- Users can plot changes in aeroallergen levels (both as a function of ambient concentration as well as duration of allergen season) across the United States in the GIS.
- Users can program aeroallergen health impact functions using the function editor.

- The program contains the demographic, baseline incidence, "pollutant" definition, and variable files needed to quantify effects
- The program reports clearly the health impact estimates in the report window and GIS, and that such results may be stratified by the same variables (e.g. age, race, sex) as the existing air pollution health impact functions.

As above, these changes may require the Contractor to modify the user interface and program logic. For these reasons, the Contractor shall reference closely the system design document and consult regularly with the WAM.

The Contractor shall not modify the source code until the WAM approves this project plan.

**Task 2.c: Application of methodology to support EPA's CIRA project**

Based on the approved methodology and revised BenMAP-CE code, the Contractor shall estimate the impacts of climate change on aeroallergens, including changes in physical, economic, and health-based metrics. This analysis shall be driven by the socioeconomic and climate projections being used in the 2nd phase of the CIRA project – in short, two representative concentration pathways (RCP8.5 and RCP4.5) in five climate models from the LOCA-CMIP5 downscaled projection dataset. Other CIRA-related modeling parameters or decision points (e.g., era delineations, discount rate/$yr) will be worked out with EPA once this work has commenced. The Contractor shall assemble, described, and display results for presentation to EPA in a memorandum.

**Task 2.d: Manuscript for peer review and publication**

In coordination with EPA staff, the Contractor shall develop a manuscript describing the new aeroallergen impacts modeling approach and results. The manuscript should carefully document the inputs, assumptions, and limitations of the approach. The Contractor shall submit the manuscript to a peer-reviewed journal, revise the manuscript accordingly based on reviewer comments, and be prepared to secure open-access publication.

**Deliverables:**

2.1 Approach memorandum
2.2 Modified version of BenMAP-CE
2.3 Results memorandum
2.4 Manuscript for publication

## VI. Reporting Requirements:

All reports shall be in accordance with contract specifications. The Contractor shall submit work products in electronic as well as hard copy form. In

addition, the Contractor shall deliver to the WAM each draft and final report in electronic format that is readable by OAQPS's windows-based word-processing (Microsoft Word 2007), graphics (Microsoft PowerPoint 2007), spreadsheet (Excel 2007), and database (Access 2007) programs.

## VII. QA Requirements:

The Contractor shall include a quality assurance section in the final report discussing the data used with respect to precision, accuracy, representativeness, comparability, completeness, sensitivity and appropriateness as it applies to this use and its source. The QA section shall discuss how the Contractor ensured that the environmental data were of acceptable quality and that they were being used for the purpose for which they were collected.

## VIII. Deliverables:

The Contractor shall adhere to the following schedule:

| Task | Deliverable | Delivery Schedule |
|---|---|---|
| 1a | Cost estimate | 20 days after effective date of WA |
| 1b | System design document | Ongoing |
| 2a | Memorandum | 2 months after the effective date of the WA |
| 2b | Modified version of BenMAP-CE | 4 months after the effective date of the WA |
| 2c | Results memorandum | 4.5 months after the effective date of the WA |
| 2d | Revised results memorandum incorporating EPA comments | TBD |
| 2e | Manuscript for publication | TBD |